(12) UK Patent Application (19) GB (11) 2 394 234 (13) A

(43) Date of A Publication 21.04.2004

(21) Application No: 0224343.4

(22) Date of Filing: 19.10.2002

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(51) INT CL[7]:
E04B 5/12

(52) UK CL (Edition W):
E1D DPC D401

(56) Documents Cited:
GB 2261235 A
GB 2227260 A
GB 2130616 A
GB 2255112 A
GB 2201436 A
GB 0525650 A

(58) Field of Search:
UK CL (Edition T) E1D DPC
INT CL[7] E04B
Other: ON - LINE : EPODOC, PAJ, WPI

(54) Abstract Title: **Cap for joist in blockwork wall**

(57) A cap 36 for a joist 12 to be embedded in a blockwork wall 10 comprises an end plate 38 which covers the end of the joist and seals the hole through the blockwork of the wall, so that if the joist shrinks, the fire resistant, and thermal and acoustic insulation properties of the wall are retained. The cap 36 may have side walls 38 , 40, and a top wall 44 as shown. In other embodiments, the top wall is omitted (Fig 13) and the side walls may be apertured (Fig 14), the rear wall may be angled (Fig 10), or the walls 40, 42,44, may have a front flange (Fig 16).

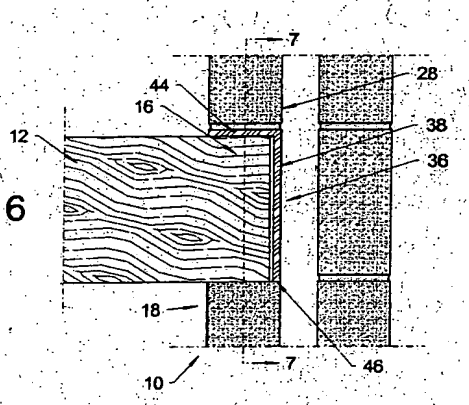


FIG. 6

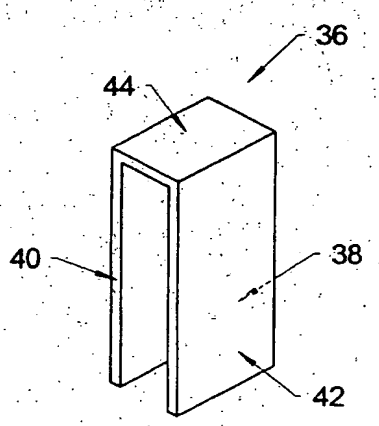


FIG. 8

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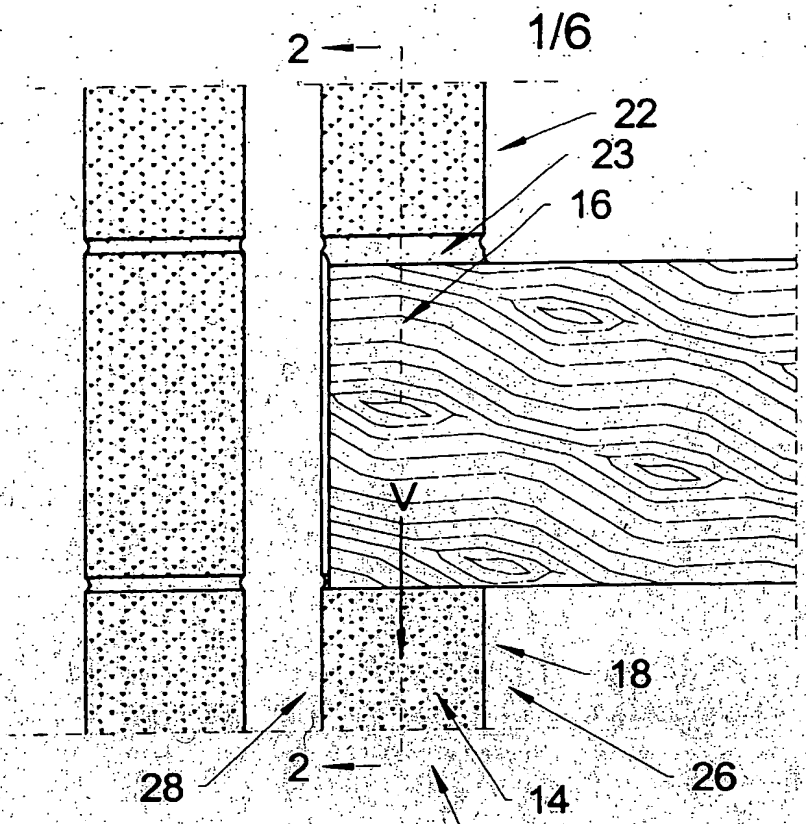



FIG. 1
PRIOR ART

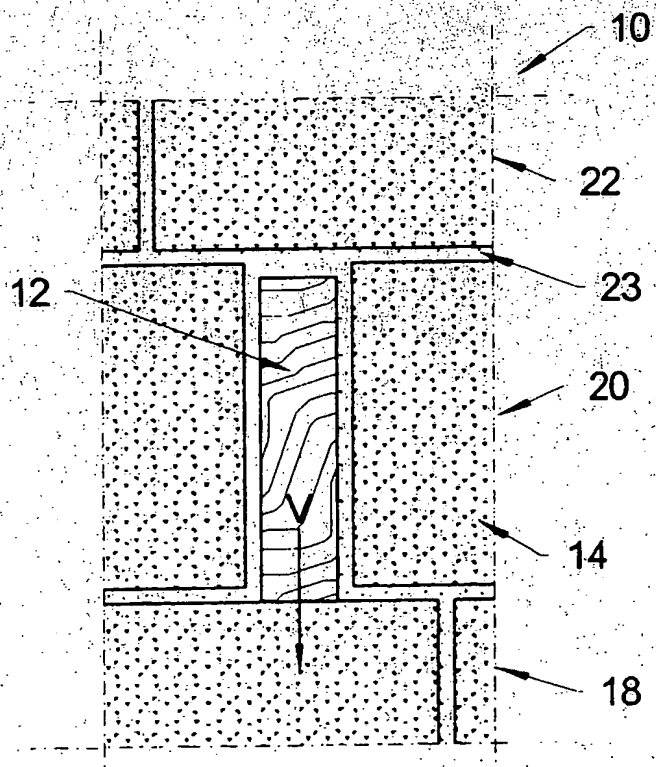



FIG. 2
PRIOR ART

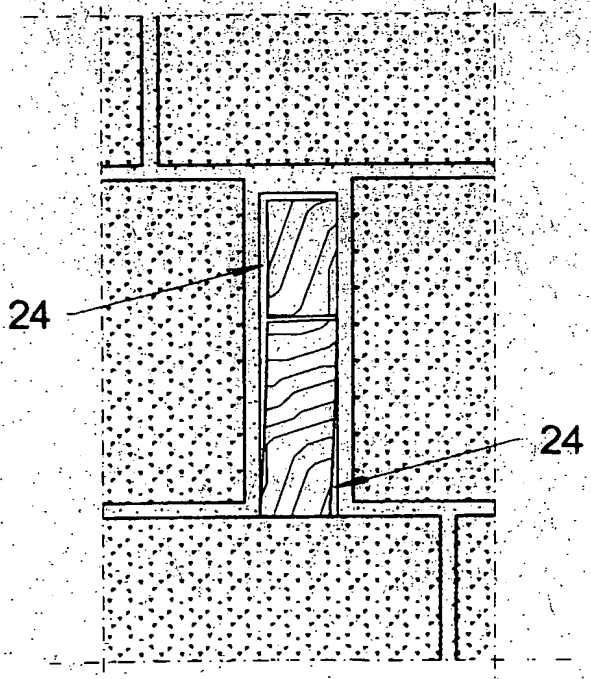



FIG. 3
PRIOR ART

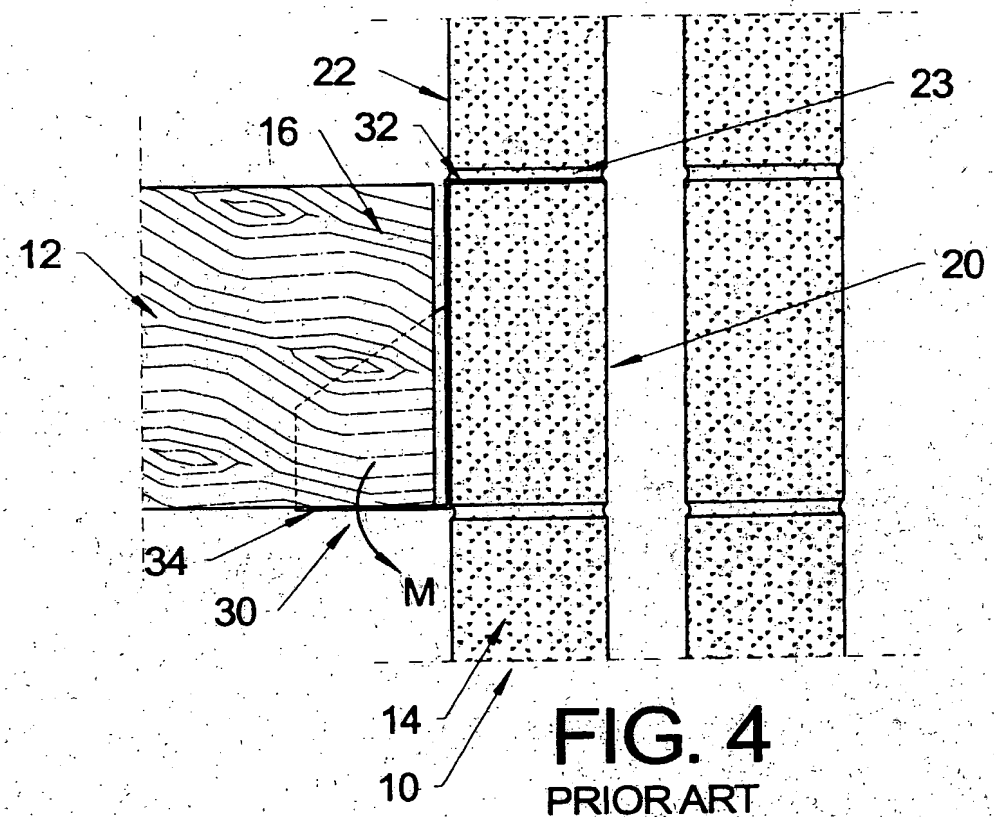



FIG. 4
PRIOR ART

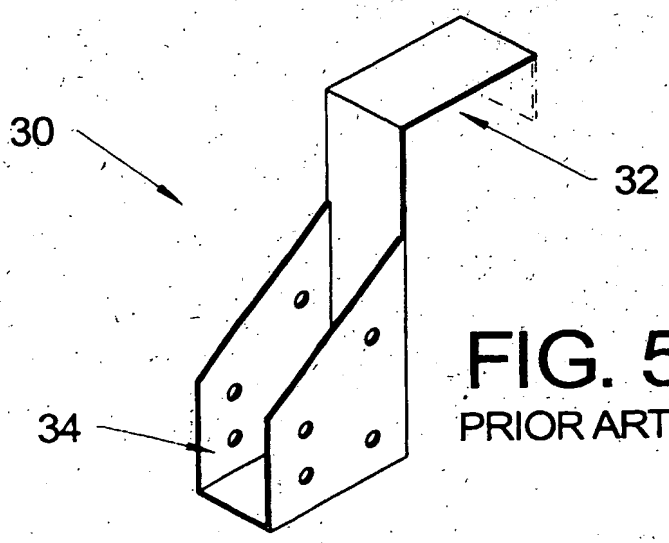



FIG. 5
PRIOR ART

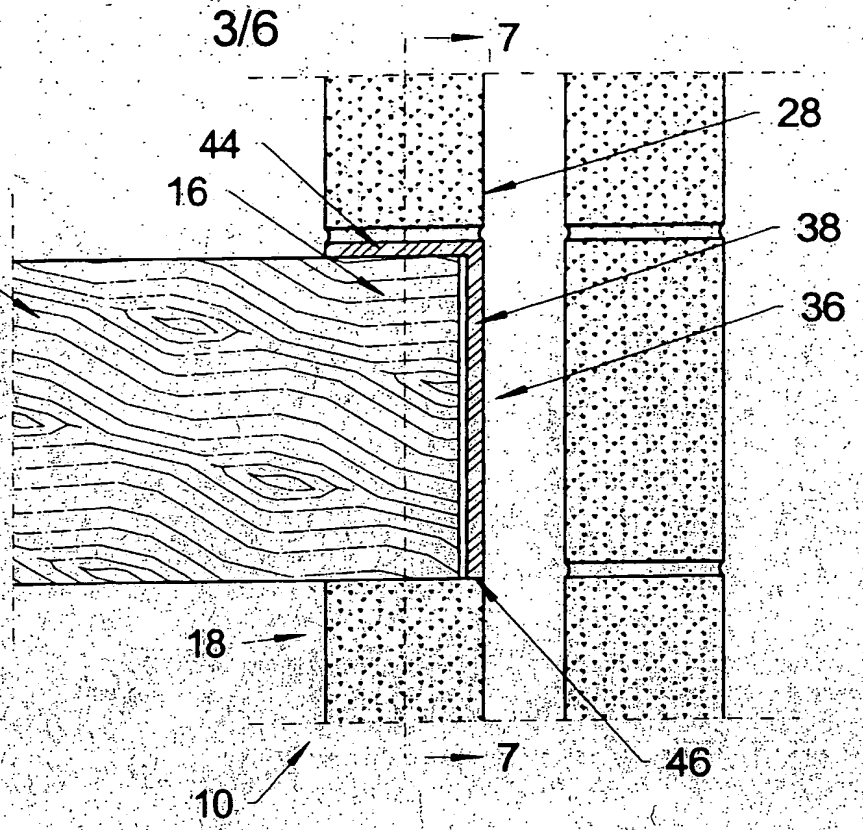



FIG. 6

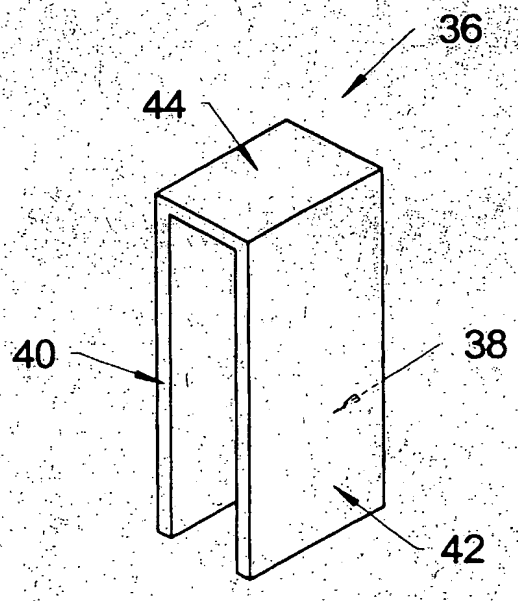



FIG. 8

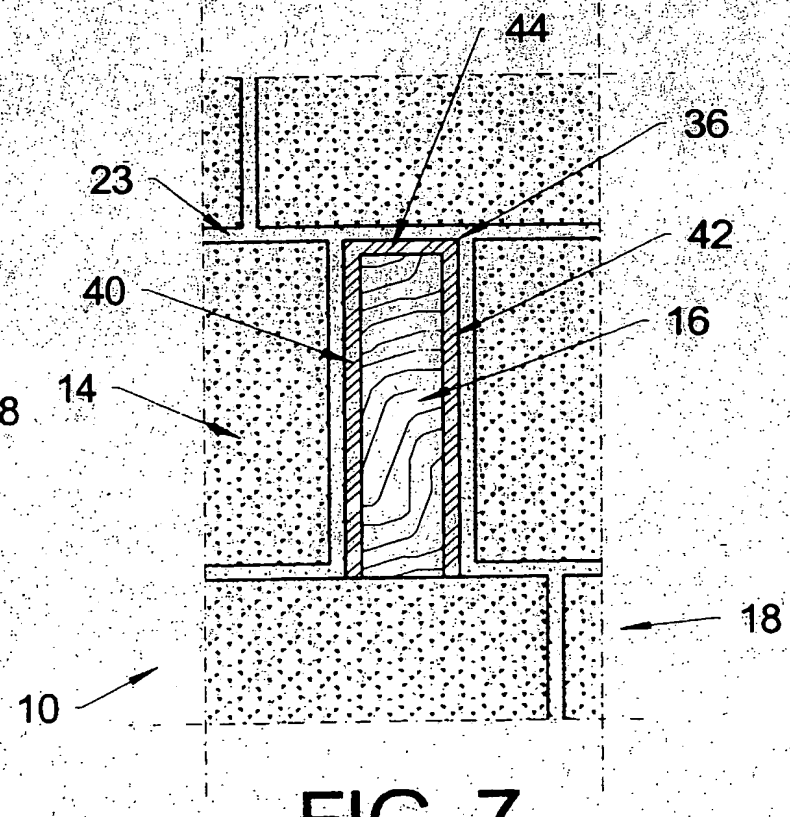



FIG. 7

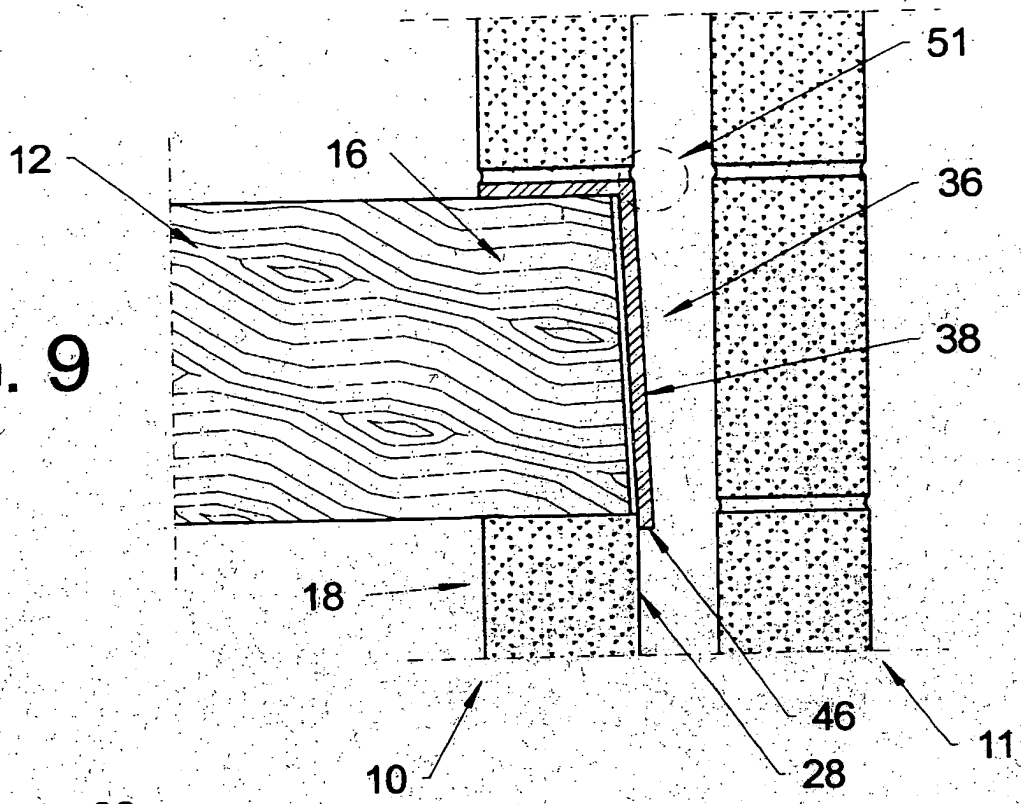



FIG. 9

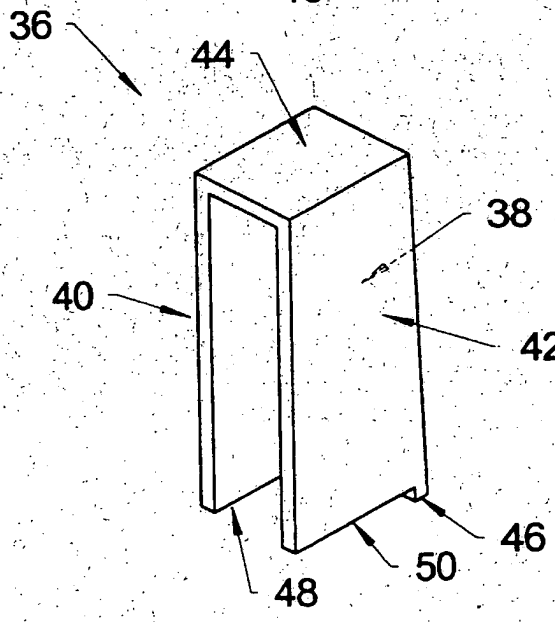



FIG. 10

FIG. 11

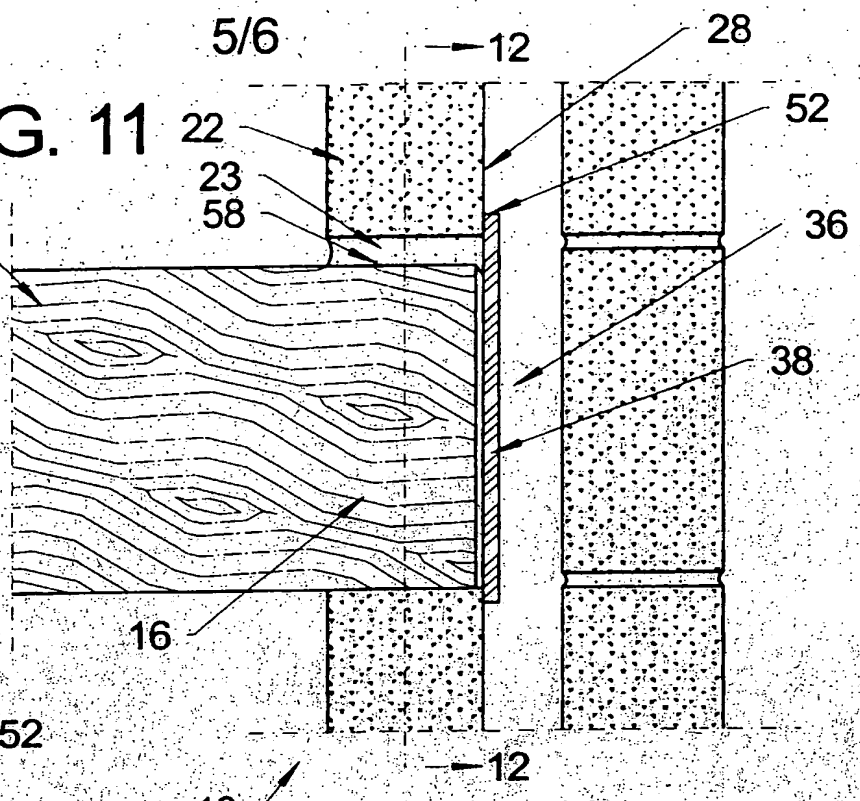
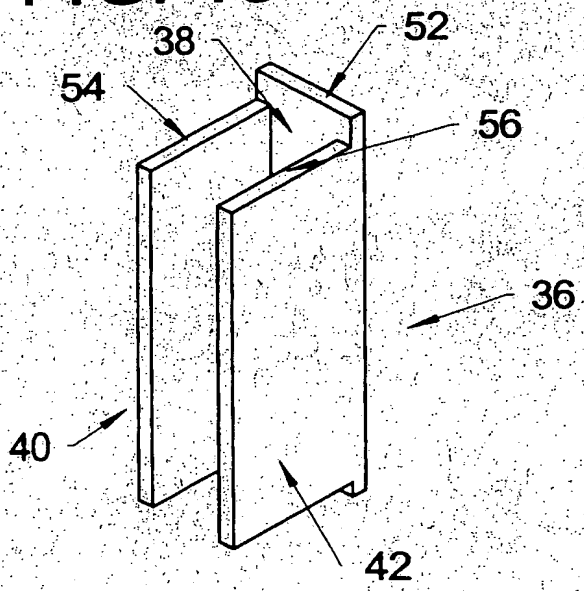



FIG. 13



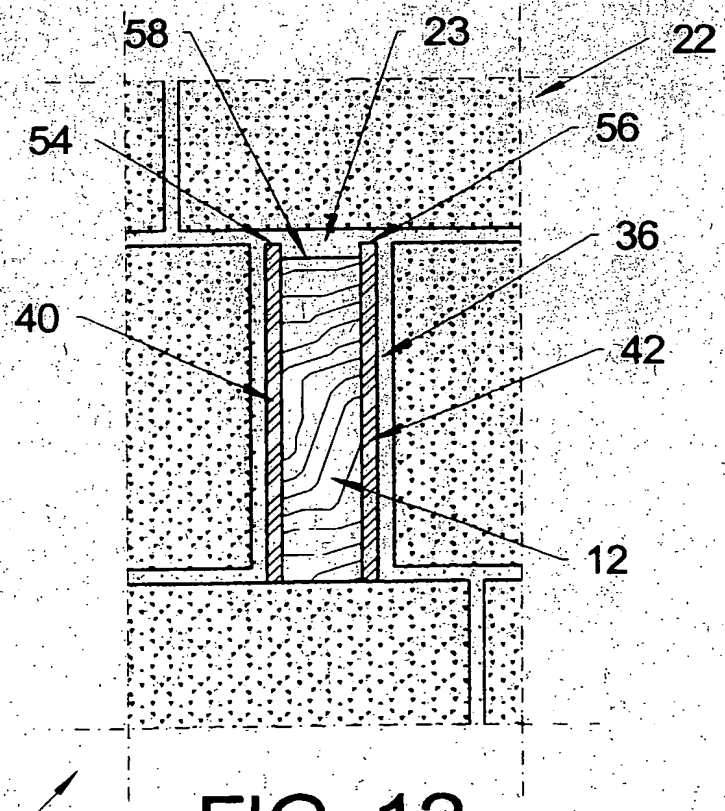




FIG. 12

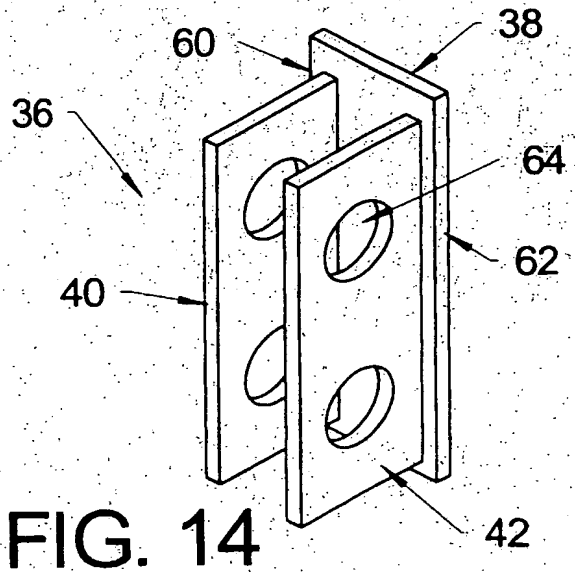



FIG. 14

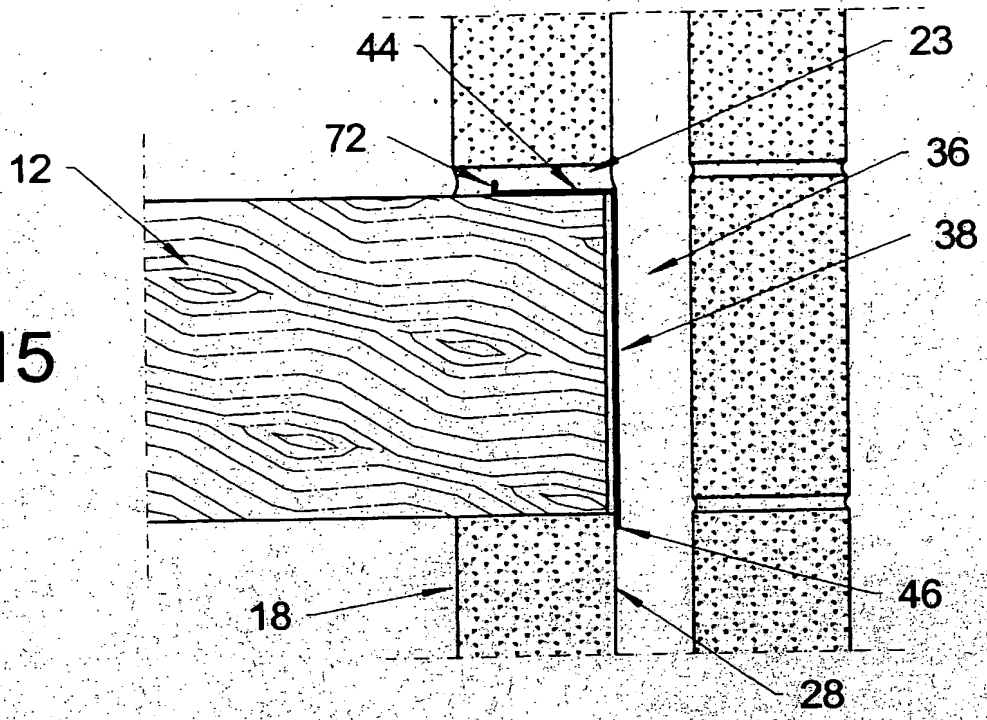



FIG. 15

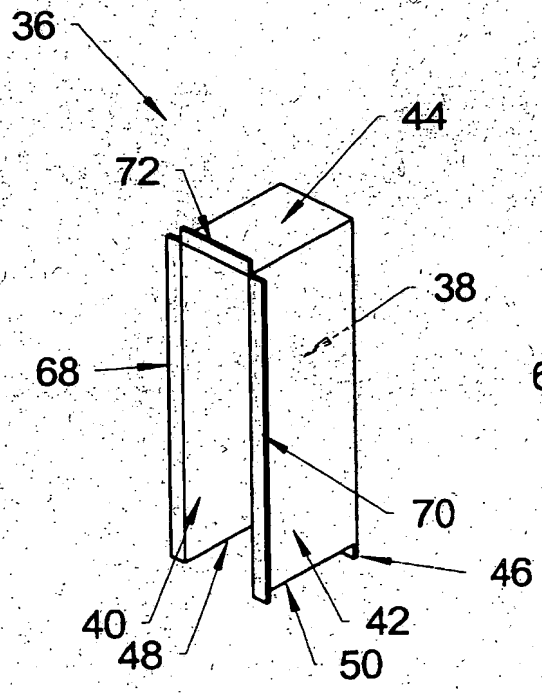



FIG. 16

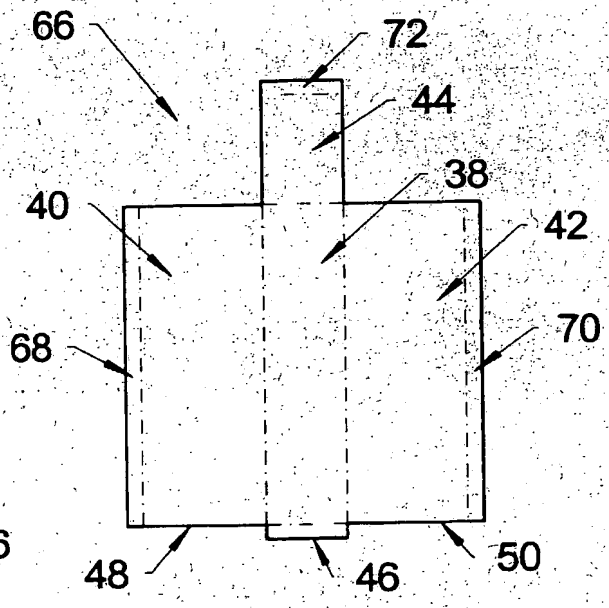



FIG. 17

TITLE

Fitting joists to blockwork walls

DESCRIPTION

This invention relates to the fitting of joists to blockwork walls and to a building element for such purpose.

In this specification, the terms "blockwork" and "blocks" include "brickwork" and "bricks" respectively.

Referring to Figures 1 and 2 of the drawings, during the construction of a traditional building having blockwork walls 10 and timber joists 12 to support a floor and/or ceiling, courses of blocks 14 are laid to a required level; the joists 12 are then put in place with their end portions 16 bearing directly on the current upper course 18 of blockwork; the spaces between the ends of the joists 12 are then filled with at least one further course 20 of blockwork; and then further complete courses 22 of blockwork are laid on the previous course 20 and the top sides of the end portions 16 of the joists 12. The end portions 16 of the joists 12 are therefore embedded in holes through the wall. This method of construction will therefore be referred to in this specification as the "embedded-end" method.

The embedded-end method provides a strong construction, even before the course 20 of blockwork between the joist ends 16 and later courses 22 are laid and before the mortar 23 has set, because the end portions 16 of the joists 12 place a vertical load V on the wall 10. A floor can therefore immediately be laid on the joists 12 and put to use. For reasons of cost, the timber usually used for joists 12 is not thoroughly seasoned. As a result, a problem with the embedded-end method is that the joist 12 will, with time, shrink and possibly split, as shown in Figure 3. This leaves a gap or gaps 24 between the joist end 16 and the blockwork, extending from one side 26 of the wall to the other 28, thus causing draughts and reducing the thermal-insulation, acoustic-insulation and fire-retardant properties of the wall.

More recently, rather than employing the embedded-end method, it has become popular to hang the end portions of the joists on joist hangers 30 as shown in Figures 4 and 5, referred to in this specification as the "joist-hanger" method. A joist hanger 30 is formed from sheet steel and has a hook portion 32 that is embedded in the mortar 23 between two courses 20,22 of blocks 14, and a cradle portion 34 in which the end portion 16 of the joist 12 sits. With the

joist-hanger method, shrinkage of the joist 12 will not cause a gap to open up through the wall, and so the problems mentioned above are avoided. For this reason, in the United Kingdom, the National House Building Council (NHBC) has recently made it mandatory to employ the joist-hanger method, rather than the embedded-end method.

However, there are serious problems associated with the joist-hanger method. Even if the joist 12 is cut to exactly the correct length, but more so if it is cut short as shown in Figure 4, the weight of the joist 12 applies a turning moment M to the hanger 30 tending to pull the hook portion 32 of the hanger 30 out of the wall 10 and/or push the wall 10 away from the end 16 of the joist 12. These forces can usually be withstood once the wall 10 is complete and the mortar 23 has developed its full strength of bond. However, until then, it is important not to place any load on the joist 12 unless additional support is provided, for example with scaffolding or Acrow® props. However, this adds to the cost and causes delay. Needless to say, corners get cut or workers are unaware of the problem, and joists collapse, causing serious injury and damage. It will be appreciated that if upper-floor joists collapse, especially if they are loaded with blocks waiting to be laid, there is a serious risk of death to anybody who may be below. Another problem with the joist hanger method is that, if the joist 12 is cut too long, it may dislodge the block 14 from which it is hung from its mortar, possibly without this being noticed, and cause a permanent weakness in the wall 10.

The aim of the present invention is to enable the stated advantages of both of the methods described above, without the stated disadvantages of either method.

In accordance with a first aspect of the present invention, there is provided a building element for use with a joist that has an end portion embedded in a hole through a blockwork wall, the building element comprising an end plate arranged to cover the end of the joist and substantially to seal the hole through the blockwork of the wall. The building element (hereafter called a "joist cap") is therefore intended to be used in the embedded-end method, and the end plate seals the hole through the blockwork. Accordingly, even if the joist shrinks so that it no longer fills the hole, the end plate prevents draughts and can maintain, at least to a significant extent, the thermal-insulation, acoustic-insulation and fire-retardant properties of the wall. The constructional dangers of the joist hanger method are avoided.

The joist cap preferably has a pair of side plates projecting from the end plate to receive the end portion of the joist therebetween and to be received between the blockwork of the wall to either side of the hole. Additionally or alternatively, the joist cap preferably has an upper plate projecting from the end plate to cover the top side of the end portion of the joist and to

receive the blockwork of the wall above the hole. These plates assist in holding the joist cap in position both while the wall is being built and after construction is complete. In one embodiment of the invention, the joist cap takes the form of a four-sided box.

The end plate may have an edge portion arranged to overlap the blockwork of the wall beneath, above, to one side and/or to the other side of the hole, so as to provide more effective sealing of the hole through the blockwork of the wall.

The side plates, upper plate and/or edge portions are preferably integral with the end plate, and indeed the joist cap may be formed from a single moulding or single blank.

The end plate may be arranged to be inclined downwardly and outwardly from the end of the joist. This feature can be employed, in the case of a cavity wall, to prevent the joist cap forming a ledge projecting into the cavity onto which surplus mortar may collect so as to bridge the cavity.

The joist cap is preferably arranged to allow the end portion of the joist to be directly supported by the blockwork beneath the hole.

The joist cap may be rigid, but may be formed of flexible material so that it can conform to the size and shape of the joist end as the blockwork is laid around it.

In accordance with a second aspect of the invention, there is provided a building having a blockwork wall, a joist that has an end portion embedded in a hole through the blockwork of the wall, and a joist cap according to the first aspect of the invention, wherein the end plate covers the end of the joist and substantially seals the hole through the blockwork of the wall.

Specific embodiments of the present invention will now be described, purely by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a sectioned side view through a cavity wall constructed using the traditional embedded-end method;

Figure 2 is a view of the wall of Figure 1, sectioned on the plane 2-2 shown in Figure 1;

Figure 3 is similar to Figure 2, but showing the joist end after it has shrunk, twisted and split;

Figure 4 is a sectioned side view through a cavity wall constructed using the known joist-hanger method;

Figure 5 is an isometric view of a joist hanger;

Figure 6 is a sectioned side view through a cavity wall constructed using a first embodiment of joist cap;

Figure 7 is a view of the wall of Figure 6, sectioned on the plane 7-7 shown in Figure 6;

Figure 8 is an isometric view of the joist cap of Figures 6 and 7;

Figure 9 is a sectioned side view through a cavity wall constructed using a second embodiment of joist cap;

Figure 10 is an isometric view of the joist cap of Figure 9;

Figure 11 is a sectioned side view through a cavity wall constructed using a third embodiment of joist cap;

Figure 12 is a view of the wall of Figure 11, sectioned on the plane 12-12 shown in Figure 11;

Figure 13 is an isometric view of the joist cap of Figures 11 and 12;

Figure 14 is an isometric view of a fourth embodiment of joist cap;

Figure 15 is a sectioned side view through a cavity wall constructed using a fifth embodiment of joist cap;

Figure 16 is an isometric view of the joist cap of Figure 15; and

Figure 17 shows a blank for forming the joist cap of Figure 15.

Referring to the first embodiment of the invention of Figures 6 to 8, the end 16 of the joist 12 is cut slightly short of the outer face 28 of the wall 10 and laid directly on the course 18 of blockwork. A joist cap 36 is placed over the end 16 of the joist 12, and the remainder of the wall 10 is built similarly to the embedded-end method described above with reference to Figures 1 and 2.

The joist cap 36 has the form of a rectangular four-sided box with an end 38, a pair of sides 40,42 and a top 44. The inner dimensions of the joist cap 36 provide a snug or slightly loose fit for the end 16 of the joist 12. The wall thickness of the joist cap 36 is preferably about 10 to 12 mm, i.e. about the same thickness as a typical layer of mortar 23. The external height of the joist cap 36 is preferably about the same as the height of the blocks 14 being used. The external depth (in the longitudinal direction of the joist 12) of the joist cap is preferably about the same as the thickness of the blocks 14 being used. The joist cap 36 is integrally formed from any suitable stable material, for example a moulded plastics material such as uPVC. The joist cap 36 may be rigid, or it may have a degree of flexibility so that it can conform to the shape and size of the end 16 of the joist 12 during construction.

It will be noted that the lower edge 46 of the end 38 of the joist cap 36 rests on the course 18 of blockwork below the joist 12, and that the outer faces of the sides 40,42 and top 44 of the joist cap 36 are embedded in the surrounding mortar 23. Therefore, if, with time, the joist 12 shrinks or splits leaving a gap, or increasing the gap, between the end 16 of the joist 12 and the joist cap 36, the end 38 of the joist cap 36 will block the gap and therefore prevent draughts and maintain, at least to a significant extent, the thermal-insulation, acoustic-insulation and fire-retardant properties of the wall 10.

Figures 9 and 10 show a second embodiment of joist cap 36 that differs from the first embodiment of Figures 6 to 8 in the following respects. In Figures 9 and 10, the lower edge 46 of the end 38 of the joist cap 36 depends beneath the lower edges 48,50 of the sides 40,42 of the joist cap 36. The joist 12 and joist cap 36 are fitted so that the end 38 of the joist cap 36 overlaps and abuts the face 28 of the course 18 of blockwork immediately beneath the joist 12. This has the advantage that the end 16 of the joist 12 can be supported by substantially the full width of the wall 10. Furthermore, the end 38 of the joist cap 36 is inclined to the vertical so that the top 44 of the joist cap 36 does not project into the cavity between the pair of walls 10,11. The end 16 of the joist 12 is cut with a corresponding inclination. This has the advantage that, when subsequent courses of blocks are laid and surplus mortar drops into the cavity between the walls 10,11, the joist cap 36 does not form a ledge in the region 51 onto which the mortar will tend to collect and possibly bridge the cavity, but instead provides a steeply sloping surface which the falling mortar will tend to slip past.

Figures 11 to 13 show a third embodiment of joist cap 36 that differs from the second embodiment of Figures 9 and 10 in the following respects. In Figures 11 to 13, the top 44 of the joist cap 36 is omitted, and the upper edge 52 of the end 38 of the joist cap 36 rises above the

level of the upper edges 54,56 of the sides 40,42 of the joist cap 36. When the wall 10 is constructed, the end 38 of the joist cap 36 preferably also overlaps and abuts the face 28 of the course 22 of blockwork immediately above the joist 12. This has the additional advantage that, during construction, the upper edge 58 of the end 16 of the joist 12 is directly embedded in the mortar 23 without there being any gap above the end 16 of the joist 12, irrespective (within limits) of the height of the sides 40,42 of the joist cap 36.

Figure 14 shows a fourth embodiment of joist cap 36 that differs from the third embodiment of Figures 11 to 13 in the following respects. In Figure 14, the side edges 60,62 of the end 38 of the joist cap 36 extend beyond the sides 40,42 of the joist cap 36. Also, to reduce material costs and assist in keying the joist cap 36 into the mortar 23, the sides 40,42 of the joist cap 36 are perforated. If desired, the perforations 64 may be filled with intumescent material that will expand in the event of fire or extreme high temperature and form an additional fire barrier.

In the third and fourth embodiments of Figures 11 to 14, if the edges 52,60,62 of the end 38 overlap the surrounding mortar, but not the surrounding blocks 14, the end 38 of the joist cap 36 may be inclined in a similar fashion to that described with reference to the second embodiment of Figures 9 and 10.

Figures 15 to 17 show a fifth embodiment of joist cap 36 that differs from the second embodiment of Figures 9 and 10 in the following respects. The joist cap 36 of Figures 15 and 16 is formed by folding a blank 66 (see Figure 17) of sheet metal, such as galvanised steel of 1 mm gauge, to produce the end 38, sides 40,42 and top 44 of the joist cap 36. The distal edges of the sides 40,42 and top 44 are further folded to form side flanges 68,70 and an upper flange 72. The widths of the sides 40,42 and top 44 of the joist cap 36 may be less than the width of the wall 10, for example three-quarters of its width. The lower edge 46 of the end 38 of the joist cap 36 depends beneath the lower edges 48,50 of the sides 40,42 of the joist cap 36. During construction, the side flanges 68,70 and upper flange 72 become embedded in the surrounding mortar 23, and the end 38 of the joist cap 36 overlaps and abuts the face 28 of the course 18 of blockwork immediately beneath the joist 12.

It should be noted that the embodiments of the invention have been described above purely by way of example and that many modifications and developments may be made thereto within the scope of the present invention.

## CLAIMS

*(The reference numerals used in the claims are not intended to limit the scope of protection sought or granted.)*

1. A building element (36) for use with a joist (12) that has an end portion (16) embedded in a hole through a blockwork wall (10), the building element comprising an end plate (38) arranged to cover the end of the joist and substantially to seal the hole through the blockwork of the wall.

2. A building element as claimed in claim 1, and further having a pair of side plates (40,42) projecting from the end plate to receive the end portion of the joist therebetween and to be received between the blockwork of the wall to either side of the hole.

3. A building element as claimed in claim 1 or 2, and further having an upper plate (44) projecting from the end plate to cover the top side of the end portion of the joist and to receive the blockwork of the wall above the hole.

4. A building element as claimed in any preceding claim, wherein the end plate has an edge portion (46,52,60,62) arranged to overlap the blockwork of the wall beneath, above, to one side of and/or to the other side of the hole.

5. A building element as claimed in any of claims 2 to 4, wherein the side plates, upper plate and/or edge portions are integral with the end plate.

6. A building element as claimed in any preceding claim, wherein the end plate is arranged to be inclined downwardly and outwardly from the end of the joist.

7. A building element as claimed in any preceding claim, and which is arranged to allow the end portion of the joist to be directly supported by the blockwork (18) beneath the hole.

8. A building element as claimed in any preceding claim, and which is formed of flexible material.

9. A building element substantially as described with reference to the drawings.

10. A building having a blockwork wall (10), a joist (12) that has an end portion (16) embedded in a hole through the blockwork of the wall, and a building element (36) as claimed

in any preceding claim, wherein the end plate (38) covers the end of the joist and substantially seals the hole through the blockwork of the wall.

11. A building substantially as described with reference to the drawings.

The Patent Office

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**Application No:** GB 0224343.4 **Examiner:** J D Cantrell
**Claims searched:** 1 - 11 **Date of search:** 19 November 2002

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# Search Report under Section 17

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): E1D: DPC

Int Cl (Ed.7): E04B

Other: ON-LINE: EPODOC, PAJ, WPI

**Documents considered to be relevant:**

| Category | Identity of document and relevant passage | | Relevant to claims |
|---|---|---|---|
| X | GB 2261235 A | SHILLABEER | 1,3,5,8,10 |
| X | GB 2255112 A | USHER | 1,3,5,10 |
| X | GB 2227260 A | MOLYNEUX | 1,3,5,10 |
| X | GB 2201436 A | HARMER | 1,3,5,8,10 |
| X | GB 2130616 A | SYMCOX | 1,3,5,8,10 |
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